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Weedy Brome-grasses and Their Control



United States
Department of
Agriculture

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Use of Pesticides

This publication is intended for nationwide distribution. Pesticides are registered by the Environmental Protection Agency (EPA) for countrywide use unless otherwise indicated on the label.

The use of pesticides is governed by the provisions of the Federal Insecticide, Fungicide, and Rodenticide Act, as amended. This act is administered by EPA. According to the provisions of the act, "It shall be unlawful for any person to use any registered pesticides in a manner inconsistent with its labeling." (Section 12 (a) (2) (G))

The optimum use of pesticides, both as to rate and frequency, may vary in different sections of the country. Users of this publication may also wish to consult their Cooperative Extension Service, State agricultural experiment stations, or county Extension agents for information applicable to their localities.



The pesticides mentioned in this publication are available in several different formulations that contain varying amounts of active ingredient. Because of these differences, the rates given in this publication refer to the amount of active ingredient, unless otherwise indicated. Users are reminded to convert the rate in the publication to the strength of the pesticide actually being used. For example, 1 pound of active ingredient equals 2 pounds of a 50-percent formulation.

The user is cautioned to read and follow all directions and precautions given on the label of the pesticide formulation being used.

Federal and State regulations require registration numbers. Use only pesticides that carry one of these registration numbers.

USDA publications that contain suggestions for the use of pesticides are normally revised at 2-year intervals. If your copy is more than 2 years old, contact your Cooperative Extension Service to determine the latest pesticide recommendations.

The pesticides mentioned in this publication were federally registered for the use indicated as of the issue of this publication. The user is cautioned to determine the directions on the label or labeling prior to use of the pesticide.

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Weedy Bromegrasses and Their Control

James A. Young, Raymond A. Evans
William O. Lee, and D. G. Swan¹

Several different species of bromegrass are serious weed pests in wheat production, grass seed production, and on sagebrush rangelands. These bromegrasses can be competitors for moisture and nutrients with crop plants; they can contaminate seedcrops; and on rangelands, beside being strong competitors, they can become a serious fire hazard.

Identification of Bromegrasses

Most of the weedy bromegrasses are annuals: they complete their life cycle of germinating, growing, and setting seed in 1 year. In some situations they can be winter annuals, germinating in the fall and remaining over winter as a small rosette of leaves to resume growth in the spring.

In the case of grass seed production fields, you may have to identify a host of relatively similar appearing species of annual bromegrass. Obtain expert assistance from your county Extension agent in identifying your weeds. If you produce wheat in the Pacific Northwest or mountain sagebrush rangelands, the primary weedy bromegrass is downy brome.²

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²A glossary of scientific and common names for plants mentioned in this publication is provided on page 22.

Downy brome is known by several other common names including cheatgrass and broncograss. As indicated by its official common name, the leaves of downy brome are covered by a soft, pubescent coat of hairs. The size of downy brome plants is highly variable depending on growing conditions. In dense stands, it may be a rather diminutive plant less than 6 inches high. Widely spaced downy brome plants on a fallow, or on rangeland after a wildfire, may become robust with tufts 18 inches high. On fertilized and irrigated cropland, downy brome plants may reach 30 inches in height.

One of the most distinctive features of downy brome and other species of weedy bromegrasses is their seeds. Downy brome seeds are approximately one-half inch long with an additional half inch of stiff, tapering awn. The seeds readily stick to clothing and animal hair.

Downy Brome on Rangelands

Raymond A. Evans

Downy brome was accidentally introduced to the sagebrush rangelands of the Intermountain area of western North America about 1900. Since then it has spread to dominate millions of acres of rangeland. Downy brome provides forage for a brief period during the spring, but it is not the most desirable forage species because (1) the amount of forage it produces fluctuates greatly, depending on seasonal growing conditions; (2) its green-feed period is short; and (3) it accumulates as fine, dry fuel, creating an extreme fire hazard in good forage production years. Per-

rennial grasses such as crested, pubescent, and intermediate wheat-grasses furnish green feed for a longer period, and they are less likely to burn. Although production of perennial grasses also fluctuates in relation to growing conditions, the fluctuations are much less pronounced than those associated with downy brome.

You will find it virtually impossible to establish seedlings of desirable perennial forage species in areas infested with downy brome until you develop some form of weed control. Downy brome can be controlled mechanically or with herbicides.

Mechanical methods include disking in the fall or spring after the downy brome has fully emerged, followed by seeding or repeated tillage to fallow the area for one growing season before seeding. There are two herbicidal treatments that you can use. In the spring, after most of the downy brome plants have emerged, spray the area to be seeded with paraquat³ at 0.5 to 1 lb/acre (a.i.). Because paraquat is deactivated when it contacts the soil, you can seed immediately after applying the herbicide. Because some broadleaf weeds are not controlled by paraquat, apply 0.5 lb/acre (a.i.) of the herbicide 2,4-D with the paraquat.

The second herbicidal weed control method for downy brome on rangeland involves the use of atrazine⁴ to create fallows. Apply atrazine at the rate of 0.8 to 1 lb/acre (a.i.) in October to control downy brome during the next

growing season. This method conserves moisture and results in the accumulation of nitrate nitrogen in the seedbed. You may plant perennial grasses the October following the herbicide application.

The atrazine fallow method does not eliminate all of the reserve of downy brome seeds in the soil. It reduces this reserve and, through litter decay, changes the quality of the seedbed so that germination of remaining seeds of the weed is prevented or greatly reduced. Seeds of broadleaf weeds such as tumble mustard and Russian thistle can germinate on these bare seedbeds. In some instances, you may have to control these broadleaf species with a low rate of 2,4-D (0.5 lb/acre a.i.) the seedling year of the perennial grass species.

Perennial grass seeds are usually planted on sagebrush rangelands with a drill because of the rough, rocky, and trashy condition of the seedbeds. On many sites, you will find it beneficial to seed with a modified rangeland drill that makes furrows.

Do not allow the perennial grass plants to be grazed until the end of the second growing season after you have planted them. Design subsequent grazing management to protect and prolong the improved grazing resource.

Weedy Brome Species in Grass Seed Production

William O. Lee

Species and Nature of Loss

Seeds of many of the major grass species are raised in the Western United States. These species include annual ryegrass, perennial ryegrass, tall fescue, creeping red fescue, orchardgrass, Kentucky bluegrass, bentgrass, and wheatgrass.

Although many weedy brome species are found in the Western United States, there are about nine species that cause significant losses

³Paraquat is registered by the Environmental Protection Agency for this use on rangelands. Paraquat is a restricted pesticide. Check with local pesticide specialist or county Extension agent.

⁴Atrazine is registered by the Environmental Protection Agency for this use on rangelands.

in grass seed production fields. Downy brome is the species that is usually found in grass seed fields east of the Cascade Mountains in Oregon and Washington and in other areas of the West. California brome, cheat, field brome, hairy chess, Japanese brome, poverty brome, rigpgut, and soft chess occur in grass seed fields west of the Cascade Mountains in Oregon (the Willamette Valley).

All of these brome species are very competitive with the grasses that are raised for seed. They not only compete with the crop species for water, nutrients, and light, but they also head earlier than the crop species and then lodge. When brome grasses lodge, they mash the crop species to the ground, often before flowering. This severely reduces or eliminates seed production where brome stands are heavy.

A number of the brome species, especially those with long awns, interfere with the harvest, transfer, and cleaning of the crop seed. The awns clog the screens in the combines and cleaners, making it necessary to shut down and clean the equipment frequently. The awns also cause the seed to mat into suspended masses in the bins. These masses plug transfer equipment used to move seed through cleaning plants.

Seed of most of the brome species are difficult to separate mechanically from the larger seeded grass species, especially when the awns are knocked off during harvest or cleaning. Thus, when weedy bromes are present in grass seed fields, they often show up as contaminants in the seed and reduce seed quality.

Crop grasses are often killed in areas heavily infested with the brome species when fields are burned after harvest. Those grasses seldom survive the intense heat created as the accumulated litter burns.

The lower seed yields, increased harvest and cleaning costs, reduced seed quality, and loss of stand that occur when weedy bromes are present cause large financial losses for grass seed growers.

Ecology

With the exception of California brome, all the weedy bromes that cause problems in grass seed crops are classified as annuals although they may act as biennials under some conditions. California brome is classified as an annual or a short-lived perennial. Thus, most of the weedy brome problems in grass fields originate from seed in the soil rather than from vegetative plant parts. In fall-planted grasses, the bromes germinate in the fall, grow and develop during the winter, and produce seed the following summer. In spring-planted perennial grasses, the bromes germinate in the spring and may produce seed later that same summer, whereas the perennial crop grasses do not produce seed until the following year. If the grass fields are clipped the first summer so that the bromes do not have an opportunity to mature seeds, they usually overwinter and produce seed the next summer.

After perennial grass seed fields have become established and harvested for seed, the fields are usually burned each year. Because of the brome's annual growth habit, burning tends to destroy the established brome plants. The plants must reestablish themselves each fall from seeds on the soil surface. California brome is an exception: many plants survive the burning and overwinter as established plants. Most of the brome seeds germinate with the first postharvest irrigation in irrigated fields or with the onset of the fall rains in non-irrigated fields. However, some

seeds may continue to germinate throughout the fall, winter, and spring whenever conditions are favorable for germination.

Control Measures

East of the Cascade Mountains in Oregon and Washington, and in the Intermountain area, downy brome is the principal weedy brome infesting grass seed fields. Selective herbicide treatments cannot be used to control this pest until after a seed crop has been harvested. Thus, many new grass plantings have severe downy brome infestations. On occasion, growers plant the grasses in rows and control the downy brome by cultivating between the rows and by removing downy brome in the row with hand labor. Such control measures are sometimes quite effective in controlling downy brome but they are too expensive to be used in most situations.

After a seed crop has been harvested, there are several selective herbicide treatments registered for use. In Kentucky bluegrass and creeping red fescue seed fields, you can apply dicamba at 2 to 4 lb/acre (a.i.) for downy brome control. Make the application in the fall after the fields have been burned and soon after the first postharvest irrigation. If the fields dry out before application, or if the downy brome gets beyond the one-leaf stage, the treatment is not effective. But, you can usually improve the effectiveness of this treatment if you use a light overhead irrigation soon after the application.

Terbacil⁵ is also registered for control of downy brome in Kentucky bluegrass and creeping red fescue seed fields in the La Grande area of northeastern Oregon. This

treatment is also applied after fields are burned and before, or soon after, the downy brome emerges. Rates of application range from 0.5 to 1.25 lb/acre (a.i.), depending on soil type. The safety margin of this treatment on perennial grasses is very narrow. To avoid crop damage, take great care in making applications.

West of the Cascade Mountains in Oregon (the Willamette Valley), most of the weedy bromes infesting new seedlings of annual and perennial ryegrass can be controlled with preemergence or early post-emergence applications of ethofumesate applied at rates of 0.75 to 1.9 lb/acre (a.i.). Applications must be made before the bromes reach the three-leaf stage to be effective. In other perennial grasses raised for seed in western Oregon, there are no treatments that can be used to selectively control weedy bromes until after a seed crop is harvested.

After perennial grasses have been harvested for seed, there are several herbicides that are effective in controlling weedy bromes growing from seed. These include atrazine, simazine, propham, chlorpropham, terbacil, and ethofumesate. The choice of the herbicide depends on the crop species involved. These herbicides are effective only if applied in the fall before the bromes get more than three leaves and only if precipitation follows soon after application. After the bromes get more than three leaves, they can no longer be controlled at selective rates. It is common practice in western Oregon to control bromes that survive the selective treatments, including California brome plants, by spot treating the glyphosate or certain other herbicides at soil sterilant rates. In low-growing grass seed crops, such as Kentucky bluegrass and bentgrass, where there is a major height differential between the crop and weed, wiping fields

⁵Terbacil registration for use in grass seed production is limited to Idaho, Oregon, and Washington.

with concentrated glyphosate solution in the spring has also been effective in controlling the tall-growing bromes.

Downy Brome in Winter Wheat Production in the Pacific Northwest

D. G. Swan

Downy brome presents the biggest control problem to the western wheat grower because we do not have a satisfactory selective herbicide for control. Management, therefore, is the principal means of dealing with this weed.

A Persistent Problem

Downy brome does not appear to be any more widespread than it was 20 years ago. However, it is not any less widespread, and the infestation definitely varies from year to year. Some growers successfully cope with this weed, perhaps because they have kept the seed population low. And, they control trouble spots immediately to keep the downy brome from shedding seed back to the soil.

As shown in table 1, an average of 10 downy brome plants per square foot in field trials decreased wheat yield by 27 percent when compared with the best herbicide treatment. In 1977, the best treatment yield was 36 percent higher than that infested with downy brome. *Best herbicide treatment may not be registered for grower use at this time. This information is presented to show the competitive effect of downy brome.*

Control Measures

Herbicides registered for downy brome control in cereal grains include trifluralin, paraquat, and metribuzin. Trifluralin is applied before seeding and is worked into the soil at a shallow depth. Then a deep furrow drill is used to seed the

crop. Downy brome control with trifluralin has averaged 70 percent.

Paraquat is registered as a salvage treatment to remove downy brome from tillered stands of wheat (wheat sending out lateral shoots). Selectivity is very narrow, making timing very important to control downy brome without excessively injuring the crop. Downy brome control with paraquat can average 70 percent with 30-percent crop injury.

Metribuzin⁶ was registered for downy brome control in wheat in 1980. Wheat must be well established with developed secondary roots before applying this herbicide. If the downy brome is also well established, control is decreased. Control has averaged 65 percent. As a bonus, metribuzin is a good broadleaf weed killer.

Cultural control or management has been the main method of downy brome control in the past. Moreover, it will continue to be used as we wait for the synthesis and development of that highly selective, effective, and safe herbicide for downy brome control. Good cultural management saves money. If you must grow a spring crop of wheat or barley to control downy brome, your yield may be down 10 or more bushels per acre compared to fall planting. If the density of downy brome is greater than 10 plants per square foot, winter wheat yields may continue to decrease. The downy brome seeds shed back to the soil perpetuating the weed control problem.

Each downy brome plant per square foot can reduce wheat yield about 3 percent, and each plant can produce 700 seeds. These seeds can live in the soil for 2 or 3

⁶Metribuzin registration for use in wheat is limited to Colorado, Idaho, Kansas, Montana, Nebraska, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming.

Table 1. Yield reduction of wheat caused by infestations of downy brome in field trials, Pacific Northwest.

Year	Downy brome plants per square foot	Wheat yield		Yield reduction
		Unweeded check	Best herbicide treatment	
	<i>number</i>	<i>-----bu/acre-----</i>		<i>percent</i>
1976	13	44	52	15
1977	15	23	36	36
1978	8	34	48	29
1979	5	11	13	15
1980	10	36	48	25
Average	10	31	42	27

years, assuring additional years of crop competition and yield reduction every time a downy brome plant matures.

You must not allow the downy brome to go to seed and you must get rid of the seeds in the soil. There are two main cultural tools to prevent downy brome from setting seed and reduce seed resources in the soil.

First, map your fields and plot the areas of infestation. Then, depending on the intensity of the problem and the weather, you should plant a spring wheat or barley crop.

Spring seedbed preparation controls most of the troublesome seedlings although a few new weeds tend to emerge later with the spring crop. You may want to use a spring crop in rotation for a couple of crop years, then grow a winter wheat crop. If most of the downy brome problem remains along field edges or in draws, plant a spring crop in those areas and a winter crop in the clean areas. With good management and sanitation,

your downy brome seed problem will lessen. You should have the problem under control within 5 years and you will then be able to grow a couple of winter wheat crops for every spring crop. Do not let the downy brome go to seed in the fallow year. Use your own ingenuity to clean up the stragglers.

Second, if the reserve of downy brome seeds in the soil is light, wait for fall rains to germinate the first flush of downy brome, then cultivate with a rod weeder before seeding the winter wheat. Additional flushes of downy brome germination usually are less of a problem.

As an alternative to rod weeding, you may let the first crop of weeds germinate, then spray the seedbed with paraquat or glyphosate. Both of these herbicides are registered for use before you plant your crop or before it emerges. This method offers you another advantage; the soil is only disturbed by the drill and few weed seeds are brought near the surface.



In the far western United States, extensive areas of rangeland formerly supported big sagebrush/perennial bunch grass plant communities. These rangelands were productive areas for grazing livestock.



About 1900, downy brome grasses began to invade sagebrush rangelands in the Intermountain area between the Sierra-Cascade Mountains on the west and the Rocky Mountains on the east. Downy brome can provide forage for livestock, but the amount of forage is highly variable from year to year depending on rainfall patterns.



The spread of downy brome greatly increased the frequency of wildfires. The fires destroyed the big sagebrush and converted the burned sites to downy brome dominance. The area shown in this photograph, near Emigrant Pass, Nevada, produced 4,000 pounds of forage per acre. This accumulation of fine dry fuel contributed to a 400,000-acre wildfire in the area. Such huge wildfires often threaten urban areas in the Intermountain area and can damage forage, wildlife cover, and watershed resources.

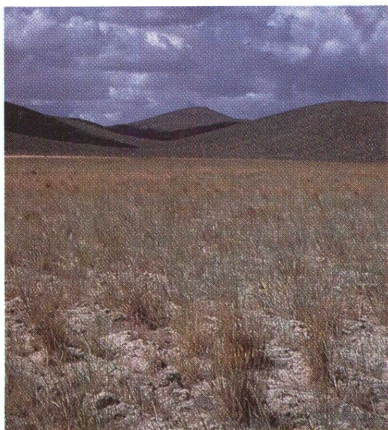


Downy brome can be controlled on rangelands by tillage, contact herbicides, or by using soil active herbicides such as atrazine. Atrazine creates a fallow which not only controls weeds, but also helps accumulate and store soil moisture and nitrogen.



At the end of the fallow period, the area can be seeded with a rangeland drill that makes deep furrows to provide a desirable seedbed for wheatgrass. This photograph shows the exotic perennial crested wheatgrass which, once established, suppresses the reinvasion of downy brome.

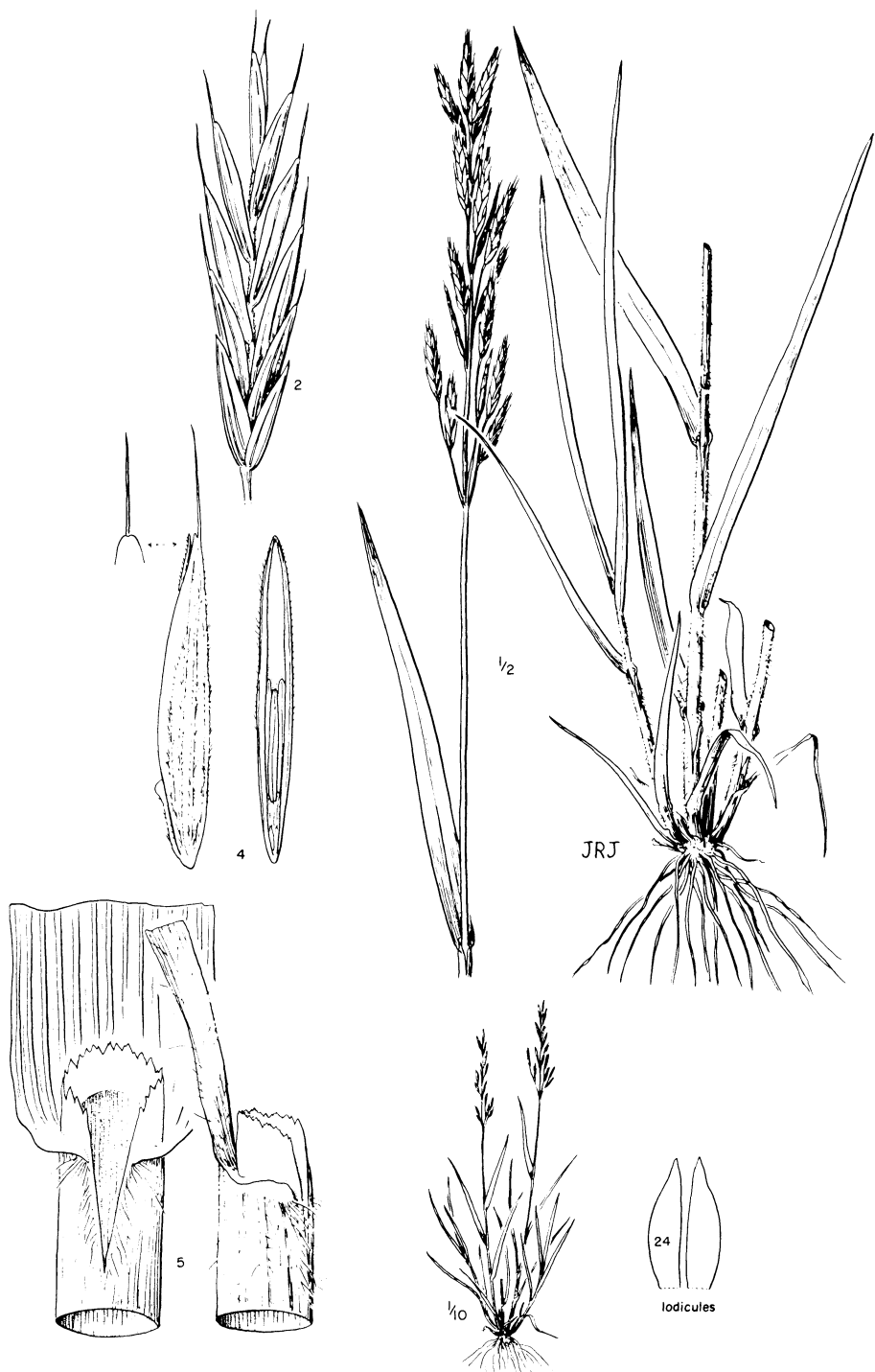
Established fields of crested wheatgrass are virtually fireproof and produce high-quality forage in the early spring.



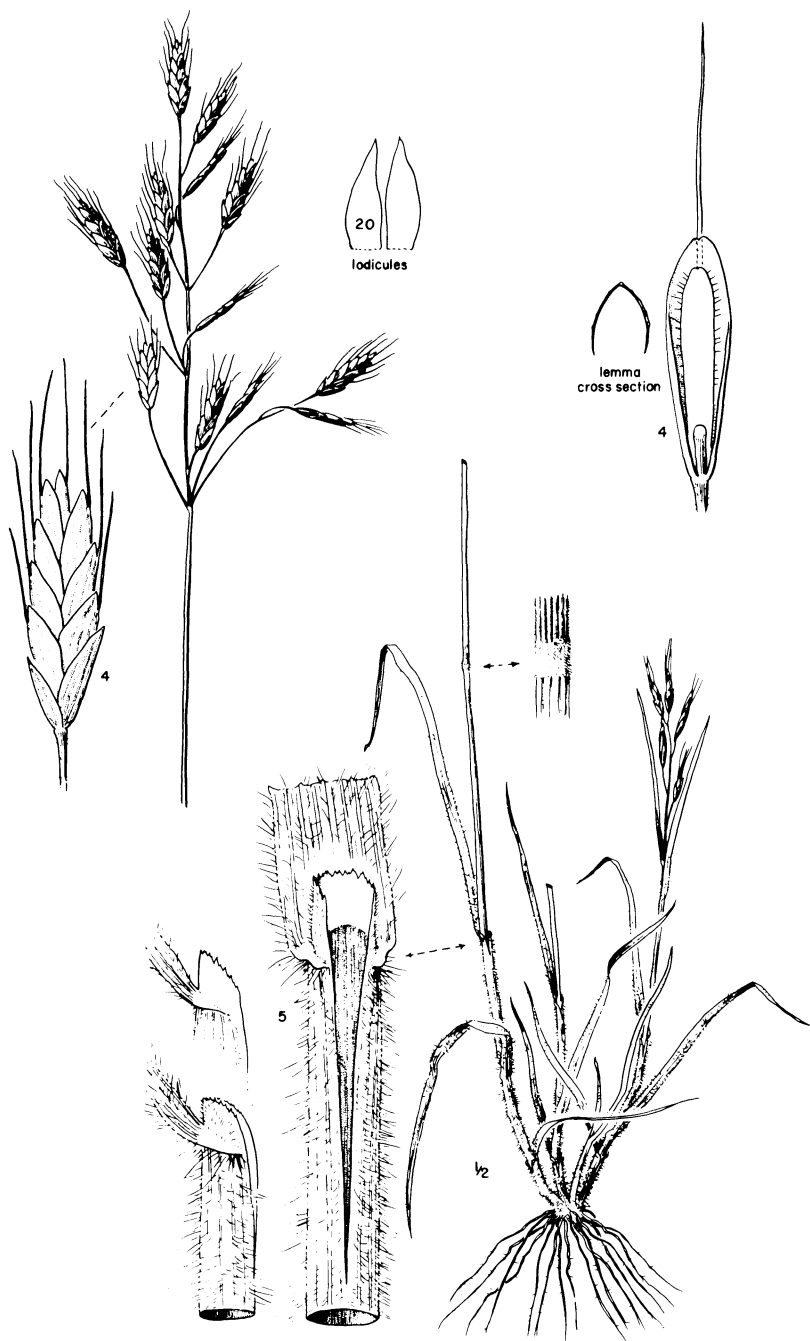
In dry years, there will be production of crested wheatgrass when there is virtually no growth of downy brome.



Downy brome in wheat.



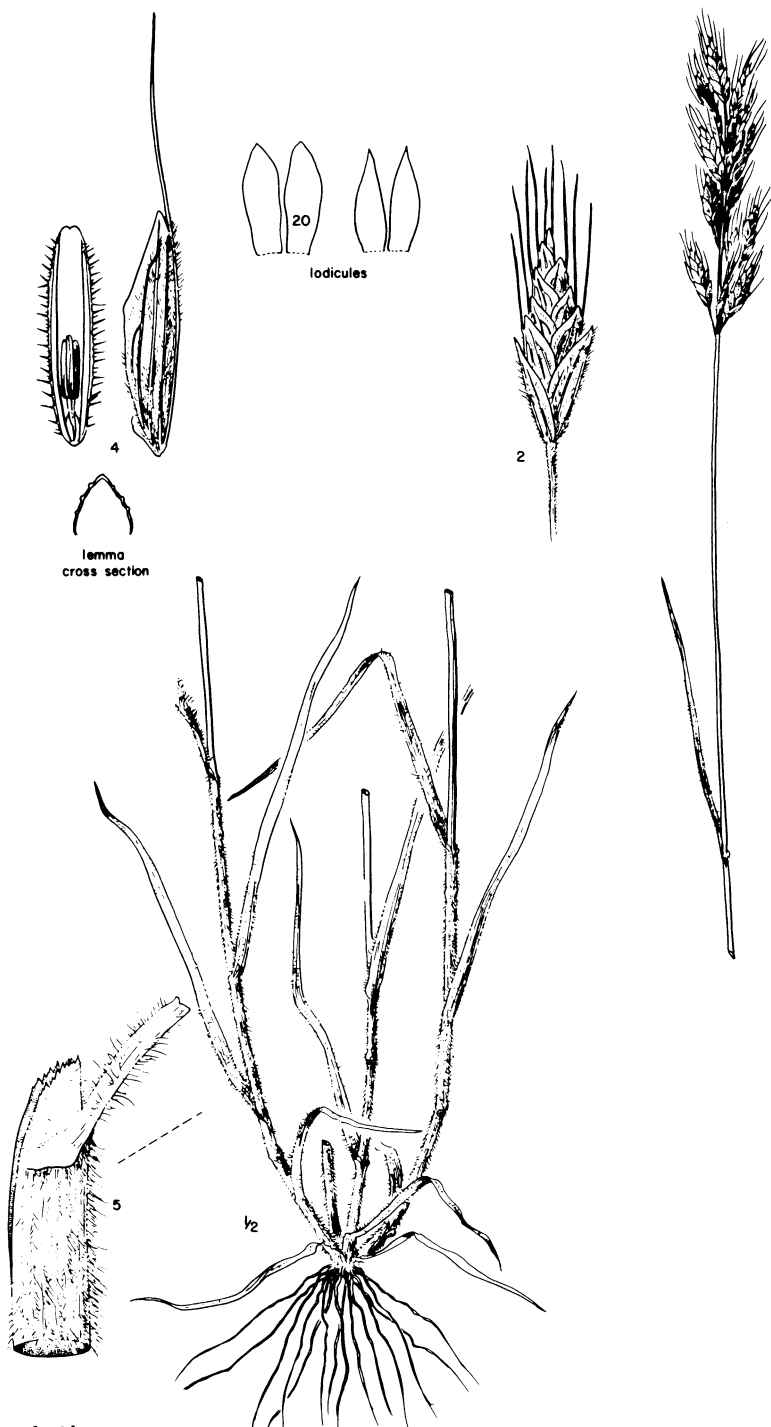
California Brome



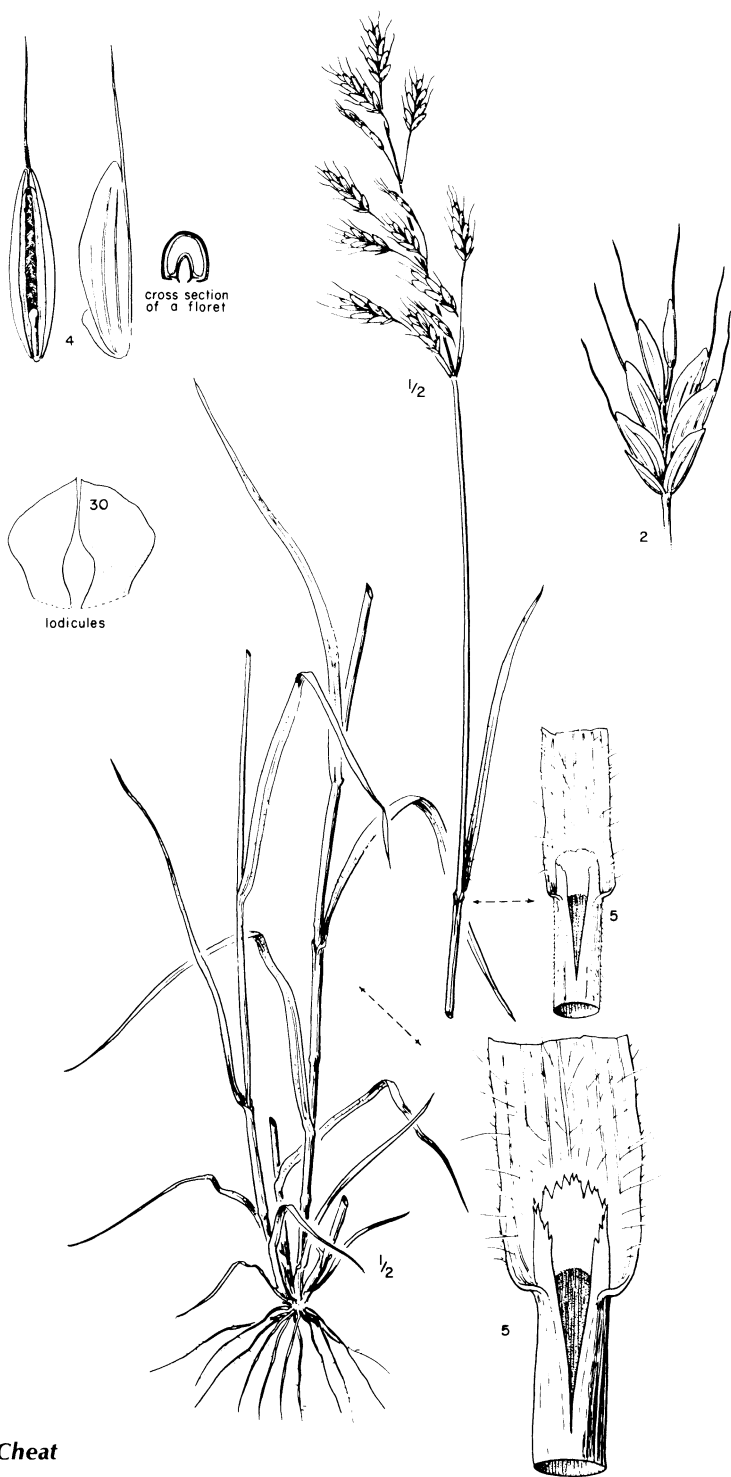
Hairy Chess



Japanese Brome



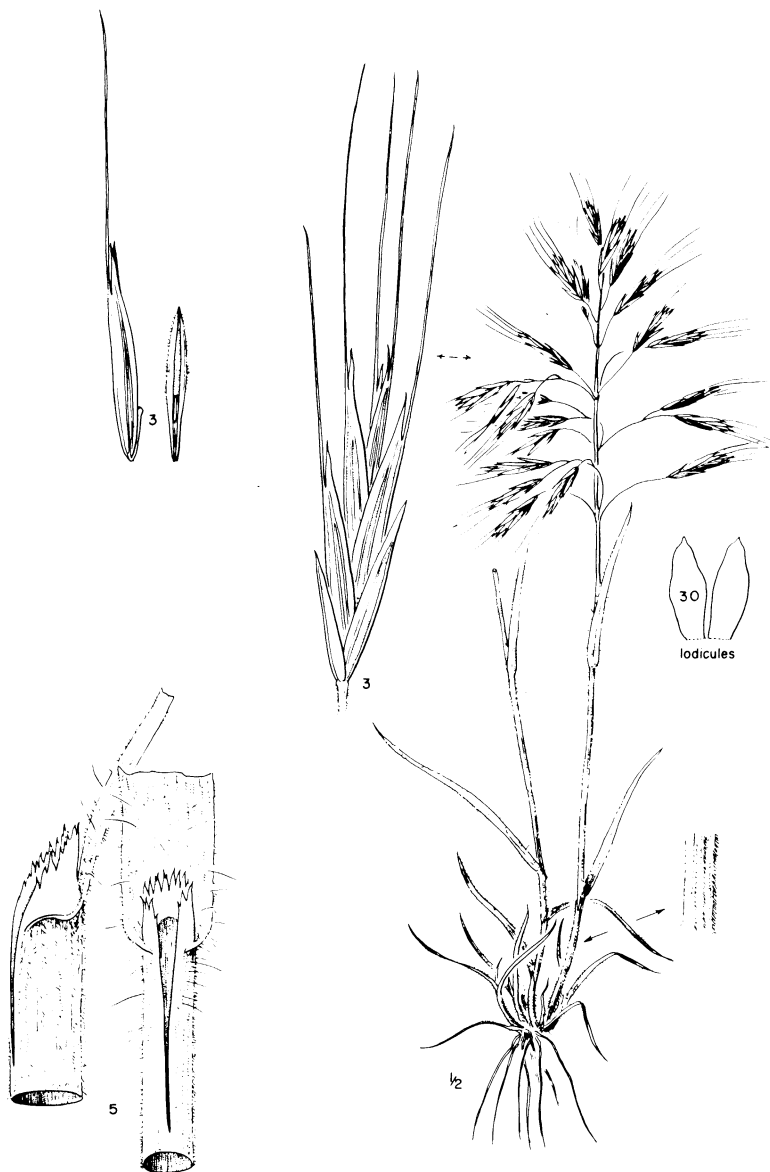
Soft Chess



Cheat



Poverty Brome



Downy Brome

Glossary of Herbicides

Common name	Chemical name
Atrazine	2-chloro-4-(ethylamio)-6-(isopropylamino)-s-triazine
Chlorpropham	isopropyl <i>m</i> -chlorocarbanilate
Dicamba	3,6-dicloro- <i>o</i> -anisic acid
Ethofumesate	(\pm)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate
Glyphosate	<i>N</i> -(phosphonomethyl) glycine
Metribuzin	4-amino-6- <i>tert</i> -butyl 3-(methylthio)-as-triazin-5-(4 <i>H</i>)-one
Paraquat	1,1'-dimethyl-4,4'-bipyridinium ion
Propham	isopropyl carbanilate
Simazine	2-chloro-4,6- <i>bis</i> (ethylamino)-s-triazine
Terbacil	3- <i>tert</i> -butyl-5-chloro-6-methyluracil
Trifluralin	α,α,α -trifluoro-2,6-dinitro- <i>N,N</i> -dipropyl- <i>p</i> -toluidine
2,4-D	(2,4-dichlorophenoxy) acetic acid

Glossary Of Plants Names

Common Name	Scientific Name
Wheatgrass	<i>Agropyron</i> Spp.
Crested wheatgrass	<i>Agropyron desertorum</i> Fisch ex. Link.
Intermediate wheatgrass	<i>Agropyron intermedium</i> (Host) Beauv.
Pubescent wheatgrass	<i>Agropyron trichophorum</i> (Link and Halac.)
Bentgrass	<i>Agrostis</i> Spp.
Field brome	<i>Bromus arvensis</i> L.
California brome	<i>Bromus carinatus</i> Hook. and Arn.
Hairy chess	<i>Bromus commutatus</i> Shrad.
Ripgut brome	<i>Bromus diandrus</i> Roth.
Japanese brome	<i>Bromus japonicus</i> Thumb.
Soft chess	<i>Bromus mollis</i> L.
Cheat	<i>Bromus secalinus</i> L.
Poverty brome	<i>Bromus sterilis</i> L.
Downy brome	<i>Bromus tectorum</i> L.
Orchard grass	<i>Dactylis glomerata</i> L.
Tall fescue	<i>Festuca arundinacea</i> Schreb.
Creeping red fescue	<i>Festuca rubra</i> L.
Italian ryegrass	<i>Lolium multiflorum</i> Lam.
Perennial ryegrass	<i>Lolium perenne</i> L.
Kentucky bluegrass	<i>Poa pratensis</i> L.
Russian thistle	<i>Salsola iberica</i> Sen. and Pau.
Tumble mustard	<i>Sisymbrium altissimum</i> L.
Wheat	<i>Triticum aestivum</i> L.

